Chemical Reactions: Unit 4

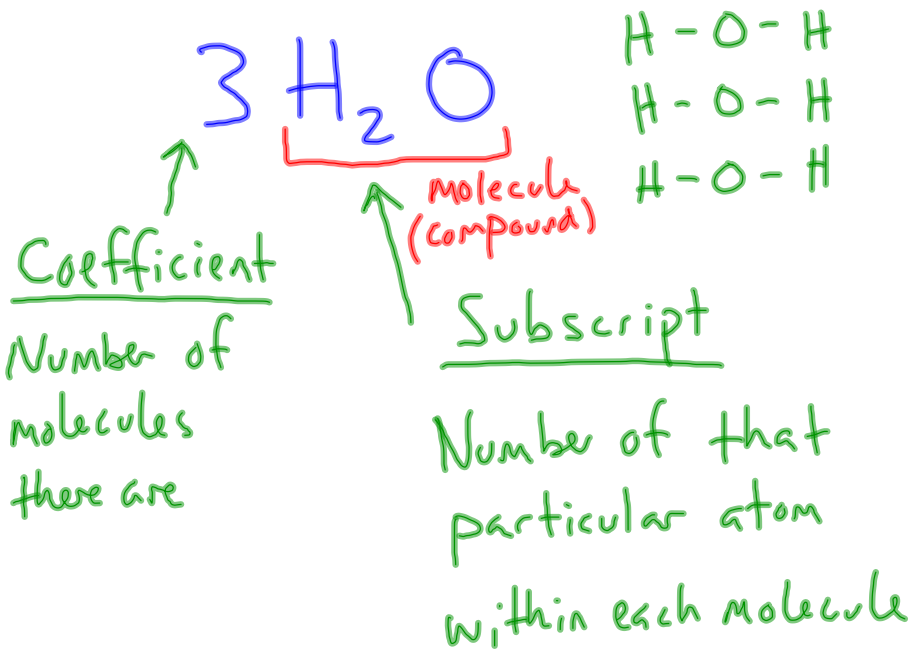
- In these, substances present at beginning of reaction are changed into something new.
- Essentially, we are breaking bonds and creating new ones.
- All chemical changes are a result of chemical reactions.
  - Happens when you make or break bonds.
  - Involves rearrangement of atoms
- One set of compounds (reactants) forms another set of compounds (products).
- Example:

$$CH_4 + 2O_2 \xrightarrow{\text{"yields"}} CO_2 + 2H_2O$$

Balanced chemical reaction

- Law of Conservation of Matter
  - Matter can neither be created nor destroyed, but it can change forms.
  - This law allows us to balance chemical reactions, because we know number of atoms on reactant side MUST equal number of atoms on product side.

- Before we start balancing...



- Practice:

$2H_2O_3$ $H = 4$ $O = 6$

$2(a+b) = 2a + 2b$

$4Fe_2O_3$ $Fe = 8$ $O = 12$

$Be(NO_3)_2$ $Be = 1$ $N = 2$ $O = 6$

$N = (2)(1) = 2$

$O = (2)(3) = 6$

- Balanced Equations:
  - To conserve atoms, we must have same number on reactant and product sides.
- Writing Chemical Equations:
  - Reactants on left
  - Products on right
  - Symbols show what is happening
    - + added to, mixed with
    - → forms, produces, yields
  - Label physical state:
    - g = gas
    - s = solid
    - l = liquid
    - aq = aqueous solution
      compound in solution with water

- Balancing Equations:

$$2H_2 + O_2 \rightarrow 2H_2O$$

Reactants	Atoms	Products
4 ~~2~~	H	~~2~~ 4
2	O	~~1~~ 2

Equation is now balanced!

- Rules:

1. Cannot change subscripts.
2. Can (will, must) change coefficients.

– Number of atoms will always increase → we cannot take away atoms.

- Examples:

$$C + 2Cl_2 \rightarrow CCl_4$$

4 ~~2~~ 1	C Cl	1 4

$$2Al_2O_3 \rightarrow 4Al + 3O_2$$

4 ~~2~~	Al	~~1~~ 4
6 ~~3~~	O	~~2~~ 6